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POLLEN LOADS ON HONEYEATERS IN A *GREVILLEA ROGERSONIANA* THICKET SOUTH OF SHARK BAY

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ABSTRACT

Three Singing Honeyeaters *(Meliphaga virescens)* and one Spiny-cheeked Honeyeater *(Acanthagenys rufogularis)* were mist-netted in a *Grevillea rogersoniana* thicket on Nature Reserve 36127 25 km SW of Cooloomia homestead on September 17, 1979. Pollen loads on both species of honeyeater consisted of large quantities of *Diplolaena microcephala* grains together with smaller amounts of *Grevillea rogersoniana* and *Banksia ashbyi* grains. The honeyeaters appeared to concentrate on *G. rogersoniana* and, to a lesser extent *B. ashbyi,* in their foraging for nectar. No feeding on *D. microcephala* was seen during 60 minutes observation in the early morning peak of feeding activity. The discrepancy between observed honeyeater foraging preferences and the relative proportions of pollen of the three plant species in pollen loads illustrates one of the divergent ways in which plants may compete for service by common pollinators.

INTRODUCTION

Prominent among the many aspects of honeyeater-plant relationships deserving study in Western Australia are questions concerning the pollen loads picked up by honeyeaters when foraging at flowers. A few recent investigations have shown that pollen of several plant species (usually 3-5, sometimes up to 12) may be carried by honeyeaters in a given habitat, but that pollen of one or two species normally predominates in the load (Paton and Ford, 1977; Burbidge *et al.,* 1979; Hopper, 1980). Moreover, there is limited evidence available indicating that the proportions of pollen of each species carried by honeyeaters are not necessarily equivalent to the frequency at which the birds visit the flowers of each plant (Hopper, 1980). This suggests that plants differ in their ability to transfer pollen to honeyeaters. The nature of such differences and the selective regimes under which they arise warrant careful study.

The present publication reports on a small investigation of pollen loads on honeyeaters made in September 1979 while I was assisting in a biological survey of a 50,000 ha Nature Reserve (Department of Lands and Survey No. 36127) located between Shark Bay and the Lower Murchison River. This Nature Reserve contains populations of a number of plants endemic in the region, including *Grevillea rogersoniana* (Proteaceae), a shrub up to 3 m tall that has pink flowers arranged in erect inflorescences that exude copious amounts of nectar.

Initial observations at a campsite in a *G. rogersoniana* thicket on the reserve 25 km SW of Cooloomia homestead (27°08'S, 114°08'E) indicated that large numbers of Singing Honeyeaters *(Meliphaga virescens)* and a few Spiny-cheeked Honeyeaters *(Acanthagenys rufogularis)* were feeding on the nectar of the *Grevillea.* The thicket contained an understorey of several shrubs including *Diplolaena microcephala* (Rutaceae) in full flower, and nearby was a grove of *Banksia ashbyi* (Proteaceae) trees 5-10 m tall with

some flowers still open. These three species all had flowers of suitable sizes and structures for pollination by birds (Fig. 1). Accordingly, birds were mist-netted so that their pollen loads could be compared with known pollen from each of three plant species, and an attempt was made to record the frequency at which honeyeaters visited flowers of each plant species.

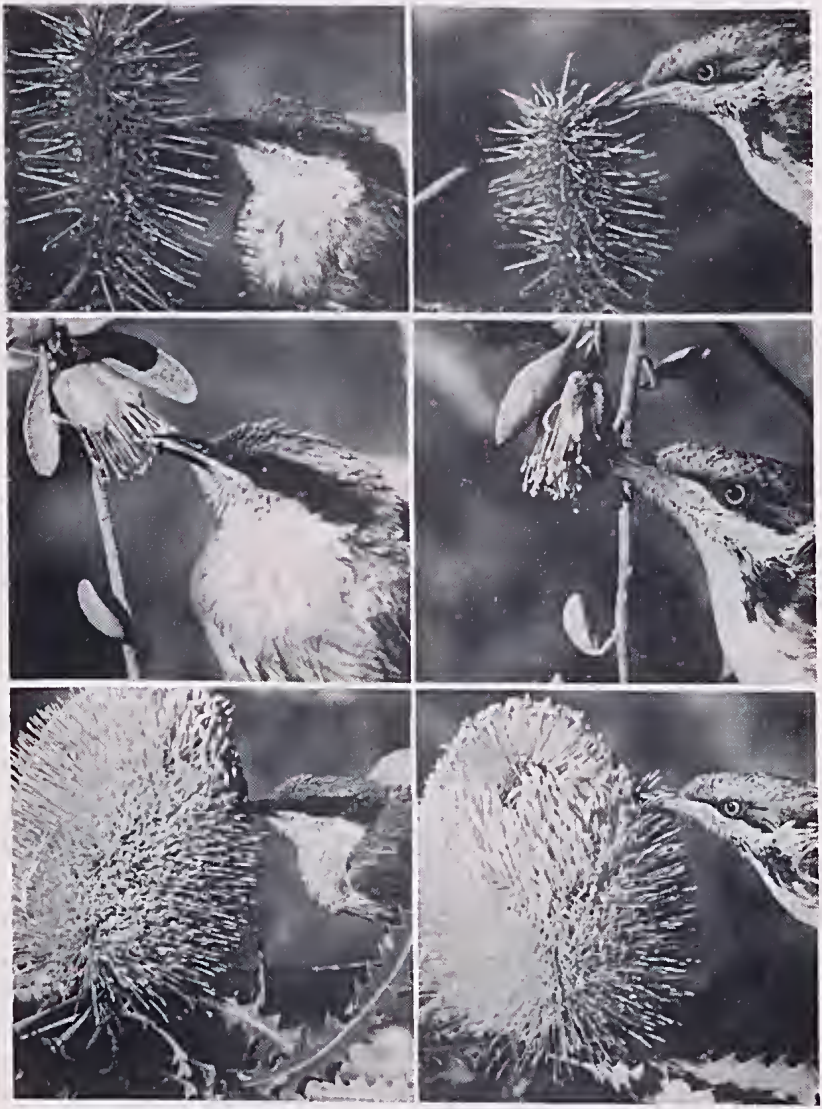

Fig. 1.—Photographs illustrating size and structural relationships of a hand-held Singing Honeyeater (left row) and a Spiny-cheeked Honeyeater (right row) with inflorescences of *Grevillea rogersoniana* (top), *Diplolaena microcephala* (middle) and *Banksia ashbyi* (bottom). The positions of the honeyeaters are comparable to natural feeding positions on *Grevillea rogersoniana* and *Banksia ashbyi*. When feeding on *Diplolaena microcephala*, honeyeaters approach the pendulous inflorescences from below rather than sideways as shown in the photographs (I. G. Crook, pers. comm.).

MATERIALS AND METHODS

Birds were mist-netted in the *G. rogersoniana* thicket over the period 0610 to 0800 hours on September 17, 1979. On capture, the head of each honeyeater was held over a glass microscope slide coated in a thin veneer of vaseline petroleum jelly and a small brush was used to remove pollen from the bill and facial feathers. The brush was flicked clean and washed in fast-drying alcohol after each bird was sampled. Reference collections of pollen of the three likely bird-pollinated plants were also placed on vaselined slides. The shape of pollen grains of each species was noted on microscopic examination of reference slides and maximum length of 10 pollen grains/species determined with a micrometer eyepiece. Three 60 x 0.6 mm transects were then examined on each slide of pollen sampled from honeyeaters and the number of grains of each plant species was recorded.

Opportunistic records of the number of feeding bouts of honeyeaters on each species were made during a total of *ca.* 60 minutes observation in the *G. rogersoniana* thicket during the early morning peak of feeding activity.

RESULTS AND DISCUSSION

Examination of reference collections of pollen showed that the grains of *Grevillea rogersoniana, Banksia ashbyi* and *Diplolaena microcephala* were distinguishable by their shape and/or maximum length (Table 1).

TABLE 1.—SHAPE AND MAXIMUM LENGTH OF POLLEN OF THE THREE BIRD-POLLINATED SPECIES IN THE *GREVILLEA ROGERSONIANA* THICKET

Plant Species	Pollen Shape	Maximum length (μm)		
		mean $\pm$ SE	range	N
Grevillea rogersoniana	triangular	69.2 $\pm$ 0.8	64.4-72.0	10
Diplolaena microcephala	ellipsoidal	50.0 $\pm$ 0.4	48.0-52.4	10
Banksia ashbyi	ellipsoidal	62.0 $\pm$ 1.2	55.6-67.6	10

Three Singing Honeyeaters and one Spiny-cheeked Honeyeater were captured. All four birds carried pollen of the three plant species, but grains of *Diplolaena microcephala* predominated, constituting 91% of the total of 731 examined on all four birds (Table 2). By comparison, pollen of *Grevillea rogersoniana* and *Banksia ashbyi* each constituted only 3% of the total number of grains. A much smaller amount of pollen was collected from the Spiny-cheeked Honeyeater than from the Singing Honeyeaters.

Observed foraging rates differed considerably from the relative proportions of pollen of the plant species in the pollen loads. In *ca.* 60 minutes opportunistic observation, Singing Honeyeaters were seen feeding at *Grevillea rogersoniana* inflorescences 7 times. They were not observed feeding on *Diplolaena microcephala* or *Banksia ashbyi*. Over the same period, Spiny-cheeked Honeyeaters were seen feeding once on *Grevillea rogersoniana*, twice on *Banksia ashbyi* and not at all on *Diplolaena microcephala*.

TABLE 2.—COMPOSITION OF POLLEN LOADS ON FOUR HONEYEATERS CAPTURED IN THE *GREVILLEA ROGERSONIANA* THICKET

Honeyeater	Number of pollen grains*				
	Grevillea rogersoniana	*Diplolaena microcephala*	*Banksia ashbyi*	Unknown	Total
Singing	5	282	2	4	293
Singing	17	286	5	8	316
Singing	0	90	17	6	113
Spiny-cheeked	2	6	1	0	9

*Number counted on three 60 x 0.6 mm microscopic transects along each vaselined glass slide.

The failure to observe honeyeaters foraging on *D. microcephala* is interesting in view of the predominance of grains of this species in the pollen loads of captured birds. This discrepancy may merely reflect deficiencies in the observational data. Alternatively, if these data reflect the real situation, it is possible that honeyeaters fed more frequently on *D. microcephala* and picked up substantial amounts of its pollen at some time of the day other than in the early morning. However, even if this did not occur, the compact arrangement of relatively large anthers in *Diplolaena* inflorescences (Fig. 1) would conceivably transfer much more pollen to a honeyeater probing for nectar on an occasional visit than would the more open array of small pollen-presenters found on *Grevillea rogersoniana* and *Banksia ashbyi* inflorescences. Indeed, it may be that the floral morphology and pollen production of *Diplolaena microcephala* were favoured by natural selection as devices to compensate for low visitation rates by honeyeaters in the face of competition from copious nectar-producing plants such as *Grevillea rogersoniana*. A critical examination of this and similar hypotheses would contribute towards further understanding of the divergent ways in which these plants exploit the service of their common pollinators.

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THE AVIFAUNA OF GARDEN ISLAND, COCKBURN SOUND

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Although this relatively large island, of area 1,100 ha, is close to the mainland, it paradoxically has been less thoroughly studied by ornithologists than Rottnest Island. In 1978 the naval facility HMAS Stirling was commissioned and subsequently there was much public discussion on the question of public access to this Commonwealth-owned island. It is therefore timely to publish an up-to-date list of bird species, comprising those recorded by earlier workers over twenty years ago as well as species recorded by me since 1974.

Those who have published their records are Alexander (1921), Serventy (1938), Sedgwick (1940), Buller (1949) and Calderwood (1953). Calderwood's list was based on a visit of one day and Sedgwick's list was the result of two visits. Serventy made six visits, each of a few hours' duration whereas Buller's list resulted from a five day visit. It is likely that these visitors concentrated on the southern parts of the island. All of my visits were made after a causeway was constructed to the island, so I have had the advantage of motor transport in covering much of the island. As well, most of the island was traversed on foot. The dates of my visits are: 26 June 1974, 13-15 (inclusive) September 1974, 7-15 February 1975, 18 August 1975, 12 December 1975 and 11 August 1978. In my February visit I mist-netted and banded birds in an *Acacia rostellifera/ Melaleuca lanceolata* low closed-forest near the Zoology Research Station.

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